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[56]

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[54] **PROTECTIVE SUIT**
9 Claims, 2 Drawing Figs.

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145.5, 145, 141, 142.4; 2/2

ABSTRACT: A life supporting protective suit having inner and outer walls and an intervening layer of porous material forming an isolation chamber between the walls. The isolation chamber is connected to an exhaust system discharging externally of the ambient atmosphere.

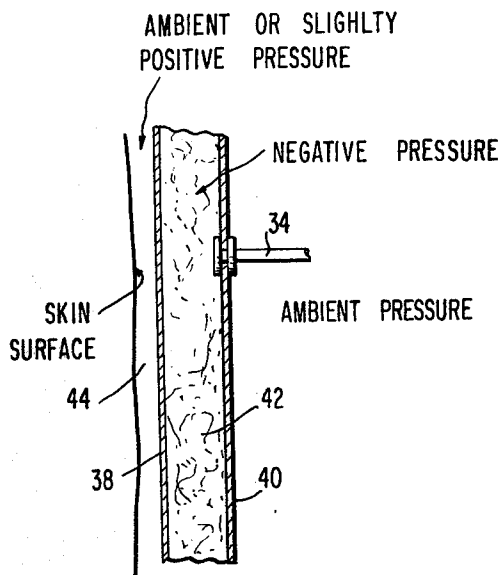


FIG. 1

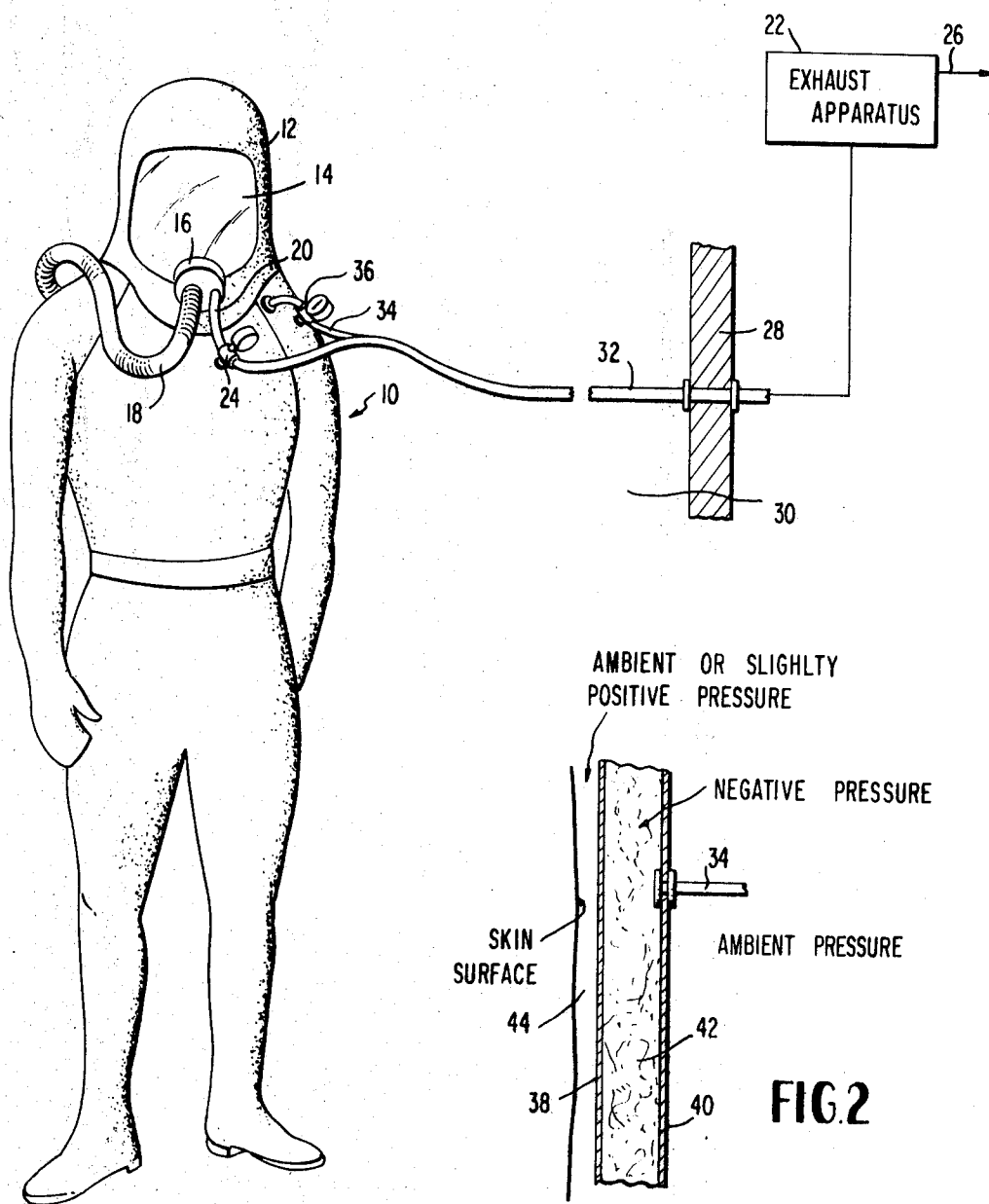


FIG. 2

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PROTECTIVE SUIT

BACKGROUND OF THE INVENTION

It is well known to provide life supporting protective suits for workmen who must operate in an atmosphere which may be oxygen deficient, toxic to them or otherwise incapable of sustaining life. To this end, the workman may be provided with a full-cover suit complete with head gear including respirator mechanism connected to some source of breathable atmosphere with breath expulsion effected directly to the ambient atmosphere. However, circumstances may make it undesirable to so contaminate the ambient atmosphere. Indeed, it may be desirable to assure that no contamination of any kind emanating from the man enter the ambient atmosphere. Under these conditions it has been suggested to fit the exhalation device as well as the interior of the suit to a suitable external exhaust source which creates a negative pressure within the suit to carry away any possible contaminant for the ambient atmosphere.

However, since the protective suits necessarily are made of flexible material the act of subjecting the interior of a suit to negative pressure can cause the suit to cling to the wearer and thereby become a source of annoyance and discomfort.

BRIEF SUMMARY OF THE INVENTION

The present invention is directed toward a protective suit which isolates the wearer from ambient atmospheres and which, through an external source of exhaust, also isolates the ambient atmosphere from the man without, however, causing the suit to cling to the wearer. Essentially, this objective is accomplished by providing a double wall suit wherein the inner and outer walls are separated and held apart by an intervening layer of porous material which forms, in effect, an isolation chamber between the walls. This chamber is connected to the external source of exhaust leaving ambient or slightly positive pressure within the suit whereby it may fit comfortably and loosely upon the wearer. Any pinholes, ruptures or other openings in either wall simply allow the exhaust system to carry off that atmosphere thereby communicated with the chamber while preserving the integrity of both the ambient atmosphere and the life supporting atmosphere within the suit.

BRIEF DESCRIPTION OF THE FIGURES OF THE DRAWING

FIG. 1 is a view showing the life supporting system in its entirety; and

FIG. 2 is an enlarged cross-sectional view taken through the protective suit.

DETAILED DESCRIPTION OF THE INVENTION

With reference to FIG. 1, a life supporting system according to the present invention will be seen to include a protective suit indicated generally by the reference character 10 and which completely encloses the wearer, being provided with a headpiece 12 having a transparent face plate 14 and fitted with a respirator device 16. The respirator device may include any conventional inhalation valve as well as an exhalation valve, the latter preferably being a demand vacuum control valve such as shown in U.S. Pat. No. 3,348,538. A flexible conduit 18 is connected to the inhalation valve and extends therefrom to a source of breathable atmosphere such as an oxygen tank, not shown, strapped to the wearer's back. The exhalation valve is connected by means of a flexible conduit 20 to an exhaust line 32 which is in turn connected to a source of exhaust 22, and the conduit 20 is provided with an adjustable valve device 24 to maintain a slightly negative pressure to the exhalation valve, it being appreciated that the exhaust apparatus 22 may take the form of a pump or other equivalent mechanism to effect a substantially continuous exhaust as indicated at 26 at a point external to the ambient atmosphere within which the wearer and his protective suit are located.

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To illustrate this, a section of a wall 28 is shown, it being appreciated that the wall 28 forms a portion of an enclosure within which the wearer is operating and on the left-hand side of which wall 28 is the ambient atmosphere region 30 which may be toxic to the occupant of the protective suit, or oxygen deficient, or otherwise incapable of sustaining human life.

The purpose of the conduit 20 and the exhaust line 32 to which it leads is to prevent contamination of the ambient atmosphere space 30 from the products of respiration of the wearer, it being appreciated that suitable sealing means is provided at the point at which the exhaust line passes through the wall 28. A branch line 34 is also connected to the exhaust line 32 and is provided with an adjustable valve device 36 for maintaining a predetermined negative pressure in an isolation chamber of the suit 10, as will hereinafter appear.

As may be seen in FIG. 2, the suit 10 is formed with an inner wall 38 and an outer wall 40 spaced from the inner wall 38, between which walls is sandwiched a layer of porous material 42 which serves to retain the walls 38 and 40 in separated condition so that they form an isolation chamber therebetween. The branch exhaust line 34 leads to and connects with the interior of the isolation chamber and by adjustment of the valve 36 continuously subjects the region between the inner and outer walls 38 and 40 to a selected negative pressure.

In this way, the protective suit 10 may hang properly and loosely in comfortable fashion on the wearer since the region between the inner wall 38 and the wearer's skin surface as indicated at 44 in FIG. 2 is subjected to ambient or slightly positive pressure. At the same time, the system completely isolates both the wearer's body from the ambient atmosphere, and the ambient atmosphere from the life supporting atmosphere within the suit. An opening in either the inner or outer wall 38, 40 will not result in cross-contamination of either atmosphere because the isolation chamber between the wall 38, 40 will be continually evacuated and will evacuate contamination emanating from the man before it reaches the atmosphere 30. In like manner, contamination from atmosphere 30 will be evacuated before it reaches region 44.

Walls 38 and 40 may be joined at spaced points, so long as the isolation chamber or chambers therebetween are in communication with the exhaust apparatus 22. Wall 38 can be treated or surfaced as may be desired for maximum comfort against the skin surface.

The spacing layer 42 can comprise any suitable material. For example, a fabric can be used, with the wool and warp spacing apart the walls 38 and 40 and providing communicating passageways for evacuating the chamber therebetween. Open cell sponge or foam materials also can be used, the cells providing communicating passageways throughout the chamber.

Also, while it is contemplated that both walls 38 and 40 normally will be impervious to gas, the inner wall 38 can be somewhat porous, at least in part, for ventilating the interior of the suit where the latter is provided with a ventilating gas. While a full suit is shown in the drawing, it will be appreciated that my invention also can be used in protective coverings other than a full suit.

Obviously, many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

I claim:

1. A life supporting system comprising a protective suit adapted to cover the body of a user, said suit comprising an inner wall and an outer impervious wall, both walls adapted to cover a substantial portion of the body of the user, spacing means forming an isolating chamber between said walls, exhaust means including a conduit means discharging externally of the ambient atmosphere, and means placing said chamber in communication with said exhaust means for evacuating said chamber, thereby to avoid contamination of the ambient atmosphere.

2. A life supporting system as set forth in claim 1, wherein said suit fully encloses the body of the user.

3. A life supporting system as set forth in claim 1, wherein said inner and outer walls are flexible, and said spacing means comprises an intervening flexible layer of porous material.

4. A life supporting system as set forth in claim 1, which includes means for maintaining the interior atmosphere of said suit at a slightly positive pressure relative to the ambient atmosphere within which said suit is intended to be used.

5. A life supporting system as set forth in claim 1, together with inhalation means for supplying breathing fluid to a user of said protective covering, and exhalation means for receiving the products of respiration of such user said exhalation means communicating with said exhaust means to carry off the

products of respiration.

6. A life supporting system as set forth in claim 1, wherein said last-named means include a pressure regulating valve for establishing a predetermined negative pressure in said isolating chamber.

7. A life supporting system as set forth in claim 1, wherein said spacing means comprise a fabric.

8. A life supporting system as set forth in claim 1, wherein said spacing means comprise an open cell sponge material.

9. A life supporting system as set forth in claim 1, wherein said inner wall is pervious to the passage of gas, together with means for supplying a ventilating gas to the interior of said suit.

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